CONTROL DATA®
3555 LINE PRINTER CONTROLLER

REFERENCE MANUAL

New features, as well as changes, deletions, and additions to information in this manual, are indicated by bars in the margins or by a dot near the page number if the entire page is affected. A bar by the page number indicates pagination rather than content has changed.

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DESCRIPTION

GENERAL DESCRIPTION

The CONTROL DATA® 3555-1 Line Printer Controller is an integrated circuit (chip) logic type controller which provides the buffering, function code translation, and operational control facilities for a CONTROL DATA® 512 Line Printer. The controller is mounted inside the line printer. Its operating switches and indicators are mounted on the line printer exterior control panels. This controller can control one printer.

FUNCTIONAL DESCRIPTION

PRINT OPERATION

A print operation begins when the incoming Channel Active line switches to a "1" condition and terminates when it switches to a "0" condition. The print operation can include one or many lines of print.

Data is received from the computer, checked for transmission parity, and entered into the controller buffer memory. If operation is in Standard mode, a 12-bit data word supplies either one or two character codes. The controller assumes that two characters are present and performs a disassembly unless an instruction is issued to suppress it. If operation is in Extended Array mode, the controller accepts the lower 9 bits of the incoming 12-bit word as pertinent data and ignores any assembly or disassembly instructions.

With Standard Mode selected, incoming data can be in external BCD or internal BCD codes. If a Negate BCD Conversion instruction is received, the controller treats the incoming data as external BCD. If the negate instruction is not received, the controller treats the incoming data as internal BCD codes. With Extended Array mode selected, the data is treated as 9-bit character codes and the controller ignores any negate BCD instructions.

For Standard mode, the code for the blank is an octal 60 in internal BCD and an octal 20 in external BCD. In Extended Array mode the code for the blank is an octal 40 (hexadecimal 20).

Print and paper motion operations can overlap so that the buffer memory can be loaded during a paper motion operation. The end of operation then becomes the completion of the last initiated operation. The end of operation, therefore, does not necessarily coincide with the change from Busy to Not Busy status.

PAPER MOTION OPERATION

A paper motion operation is started by any of the following codes from the data channel: Single Space (0001), Double Space (0002), Advance to Last Line (0003), Page Eject (0004), or any preprint spacing code (0051 through 0064). Automatic spacing and postprint spacing are not in this category. Automatic postprint spacing is the cleared condition.

I/O CHARACTERISTICS

This controller has standard CDC 3000 series computer system input/output characteristics.

BUFFER MEMORY

The buffer memory is a core-type memory which is mounted on four 50-PAK plug-in modules. It holds one line of print in 136 character positions, each with 12 bits capacity. The lower 9 bits are for data, the 10th is a parity bit, and the 11th is a flag bit. The cycle time of this memory is approximately 2.0 μsec.

Data is entered into this memory with controller-generated odd parity for each character. The controller also adds a flag bit to each printable character (one for which the type train has a character and not blanks). This flag bit is used by the controller to ensure that all characters entered into the memory are printed and that the memory is empty at the end of a print operation.

Printing starts after 136 characters have been entered into the buffer memory and continues until the Write line drops and the Channel Active Line drops. If fewer than

136 characters are received, printing starts after the memory has been filled with blanks by the controller. The print cycle is terminated when one or two revolutions of the train have been completed with all characters in memory having been printed or optioned to print.

ERROR DETECTION MEMORY

The error detection memory is a core-type memory which is mounted on three plug-in modules. It has 136 character positions with 5 bits capacity for each position. Each of the 136 positions in the error memory corresponds with a specific position in the buffer memory. The lowest bit position is for a "printable character" bit, the second is for a "character compare" bit, the third is for a "character printed" bit, the fourth is for an "error" bit, and the fifth is for a "hammer response" bit.

In the initial print scan of a print cycle, when a hammer is optioned and a compare takes place, the corresponding error memory "character compare" bit is set. During the next print scan, the "printable character", "character compare", "hammer response", and "character printed" bits are compared. If any of the following comparisons is made, the "error" bit is set.

- The "character compare" bit is "1" and the "printable character" bit is "0".
- The "character compare" bit is "1" and the "hammer response" bit is "0".
- The "character compare" bit is "0" and the "hammer response" bit is "1".
- The "character compare" bit is "1" and the "character printed" bit is "1".

At the completion of a print cycle, one more search is made through the memory to check for errors in the last print scan. During this search, any unprinted characters still in the buffer memory are reported as errors.

If a buffer memory parity error is detected in any character position, the corresponding "error" bit position is set.

The error checking facilities detect the following types of errors and indicate in which character position the error is recorded:

- A selected hammer did not fire.

- A hammer which was not selected fired.

- A hammer fired more than once in a print cycle.

- The code intended for a hammer was an illegal code (one which did not represent an available character).

- The data intended for a hammer had wrong parity.

When any of these errors is detected, the print error FF is set to put a print error status report on the line. The program can then perform a Read operation which, with the print error status present, will scan the error bit positions and report the locations of any detected errors.

IMAGE MEMORY

The image memory is a core-type memory which is mounted on four 50-PAK plug-in modules. It holds 288 10-bit characters. The lower 9 bits of each character are for data and the 10th bit is for parity. The cycle time of this memory is approximately 2. 0 μsec.

The image memory contains 288 characters which correspond with the 288 characters on the print train. The memory contents exactly reflect the train configuration and must be changed if the train configuration is changed. For information on changing the train, and for information about changing the image memory contents, refer to the Customer Engineering manual for the 512 Line Printer and the Programming Consideration section of this manual.

PROGRAMMING

FUNCTION AND STATUS CODES

The codes which are applicable to the controller and the printer are listed below and are explained in the text which follows the listings.

Function Codes

Release and Disconnect	0000
Single Space	0001
Double Space	0002
Advance to Last Line	0003
Page Eject	0004
Auto Page Eject	0005
Suppress Space	0006
Conditional Clear Format	0007
8 Line Select	0010
6 Line Select	0011
Fill Image Memory	0012
Select Extended Array	0013
Clear Extended Array	0014
Select Interrupt on Ready and Not Busy	0020
Clear Interrupt on Ready and Not Busy	0021
Select Interrupt on End of Operation	0022
Clear Interrupt on End of Operation	0023
Select Interrupt on Abnormal End of Operation	0024
Clear Interrupt on Abnormal End of Operation	0025
Reload Memory Enable	0026
Clear Format Selections (Postprint Spacing Mode)	0030
Select Format Level 1 for Postprint Line Spacing	0031
Select Format Level 2 for Postprint Line Spacing	0032
Select Format Level 3 for Postprint Line Spacing	0033
Select Format Level 4 for Postprint Line Spacing	0034
Select Format Level 5 for Postprint Line Spacing	0035
Select Format Level 6 for Postprint Line Spacing	0036

Function Codes (Cont'd)

Select Format Level 7 for Postprint Line Spacing	0037
Select Format Level 8 for Postprint Line Spacing	0040
Select Format Level 9 for Postprint Line Spacing	0041
Select Format Level 10 for Postprint Line Spacing	0042
Select Format Level 11 for Postprint Line Spacing	0043
Select Format Level 12 for Postprint Line Spacing	0044
Preprint Spacing Mode	0050
Select Format Level 1 for Preprint Line Spacing	0051
Select Format Level 2 for Preprint Line Spacing	0052
Select Format Level 3 for Preprint Line Spacing	0053
Select Format Level 4 for Preprint Line Spacing	0054
Select Format Level 5 for Preprint Line Spacing	0055
Select Format Level 6 for Preprint Line Spacing	0056
Select Format Level 7 for Preprint Line Spacing	0057
Select Format Level 8 for Preprint Line Spacing	0060
Select Format Level 9 for Preprint Line Spacing	0061
Select Format Level 10 for Preprint Line Spacing	0062
Select Format Level 11 for Preprint Line Spacing	0063
Select Format Level 12 for Preprint Line Spacing	0064

Status Codes

Ready	XXX1
Busy	XXX2
Compare Fault	XXX4
Paper Fault	XX1X
Last Line of Form	XX2X
Format Tape Level 9	XX4X
Memory Busy	X1XX
Ready and Not Busy Interrupt	X2XX
End of Operation Interrupt	X4XX
Abnormal End of Operation Interrupt	1XXX
Print Error	2XXX
6/8 Line Coincident	4XXX

FUNCTION CODE DESCRIPTIONS

The function codes are used to carry operating instructions to the controller. When connected to the data channel, the controller accepts, responds to, and replies to the function codes 0000 and 0020 through 0026 if there is no parity error in the code transmission. The controller responds and replies to the remaining function codes if those same requirements are met and the controller and printer are also Ready and Not Busy. If some of the requirements are not satisfied or if an illegal function code (one which is not listed for this equipment) is received by the controller, the controller issues a Reject signal to the data channel.

Release and Disconnect (0000)

This code disconnects the controller and printer from the data channel, clears all interrupt selections and responses, and clears transmission parity error indications.

Single Space (0001)

This code advances the paper one line.

Double Space (0002)

This code advances the paper two lines.

Advance to Last Line (0003)

This code advances the paper until a punched hole is detected in format channel 12 of the format tape (last line of form).

Page Eject (0004)

This code advances the paper until a punched hole is detected in format channel 1 of the format tape (top of form).

Auto Page Eject (0005)

This code provides automatic spacing from the last line of form (format level 12) to the top of the next form (format level 1) the next time format level 12 is reached. This code can be cleared only with a 0030 function code or a Master Clear.

If the paper has reached the last line of form (format level 12), any computer initiated paper motion will cause the paper to advance to the next format level 1 (top of form). If the paper is not at the last line of form and a paper motion that will space paper beyond level 12 is initiated, the paper will be advanced only to the next format level 1 (top of form).

In the postprint spacing mode, spacing begins automatically after the completion of printing on last line of form. The paper will be advanced to the next format level 1 (top of form).

Suppress Space (0006)

This code suppresses the next postprint spacing operation and then clears.

Conditional Clear Format (0007)

This code clears any format selections except Auto Page Eject (0005) and 8 Line Select (0010).

8 Line Select (0010)

This code directs the printer to print at a density of 8 lines per inch. Once selected, this mode will stay selected until cleared by a 0011 code, a 0030 code, or a Master Clear.

6 Line Select (0011)

This code directs the printer to print at a density of 6 lines per inch. This is the cleared condition (selected by a 0030 code or Master Clear). The printer will print at this density if a 0010 code has not been issued.

Fill Image Memory (0012)

This code directs that the image memory be loaded from the data channel. A Master Clear will clear this code but the normal method of clearing is the loading of exactly 288 character codes into the image memory. A Master Clear does not clear the image memory. See the Programming Considerations section of this manual for instructions on filling the image memory.

Select Extended Array (0013)

This code directs the controller to accept the lower 9 bits of each data word as a complete data word. This code can be cleared by a Master Clear or a 0014 function code.

Clear Extended Array (0014)

This code clears a Select Extended Array mode and returns the controller to the standard mode.

Select Interrupt on Ready and Not Busy (0020)

This code causes the controller to generate an interrupt signal when a Ready and Not Busy condition is detected. This interrupt is issued immediately if a Ready and Not Busy condition exists when the code is issued.

Clear Interrupt on Ready and Not Busy (0021)

This code clears the Select Interrupt on Ready and Not Busy mode and removes any resulting interrupt signals.

Select Interrupt on End of Operation (0022)

This code causes the controller to generate an interrupt signal on completion of the last initiated operation (either print or computer-initiated paper motion).

Clear Interrupt on End of Operation (0023)

This code clears a Select Interrupt on End of Operation and removes any resulting interrupt signals.

Select Interrupt on Abnormal End of Operation (0024)

This code causes the controller to generate an interrupt signal on the completion of an operation during which an abnormal condition was detected. This interrupt is also used for selecting an interrupt on error unless the ERROR OVERRIDE switch is activated.

Clear Interrupt on Abnormal End of Operation (0025)

This code clears the Select Interrupt on Abnormal End of Operation and removes the resulting interrupt signal.

Reload Memory Enable (0026)

This code clears the print FF's and the transmission parity error FF to enable the entry of corrected data into memory after a transmission parity error has prevented the printing of data in the memory. The data containing the error is not printed.

Clear Format Selections (Postprint Spacing Mode) (0030)

This code selects the postprint spacing mode by clearing all format selections including Auto Page Eject and suppress space selections. This is the initial or cleared condition and provides automatic single spacing after each line of print.

Select Format Level 1 for Postprint Line Spacing (0031)

The codes 0031 through 0044 select format levels for postprint line spacing. Spacing starts on completion of a line of print (unless inhibited by a suppress space code) and terminates when a hole is detected in the format tape at the selected format level (unless an Auto Page Eject condition modifies the operation). This selection is cleared on completion of the specified motion. It is also cleared by a single space (0001) or double space (0002) function issued before printing is begun.

Select Format Level 2 for Postprint Line Spacing (0032)

Select Format Level 3 for Postprint Line Spacing (0033)

Select Format Level 4 for Postprint Line Spacing (0034)

Select Format Level 5 for Postprint Line Spacing (0035)

Select Format Level 6 for Postprint Line Spacing (0036)

Select Format Level 7 for Postprint Line Spacing (0037)

Select Format Level 8 for Postprint Line Spacing (0040)

Select Format Level 9 for Postprint Line Spacing (0041)

Select Format Level 10 for Postprint Line Spacing (0042)

Select Format Level 11 for Postprint Line Spacing (0043)

Select Format Level 12 for Postprint Line Spacing (0044)

Preprint Spacing Mode (0050)

This code selects the preprint spacing mode but does not start paper motion. This mode suppresses the automatic initiation of paper motion after a print operation.

This selection is cleared by a Master Clear, a 0007 or 0030 code, or by selection of any postprint line spacing format.

Select Format Level 1 for Preprint Line Spacing (0051)

The codes 0051 through 0064 select the preprint spacing mode and direct movement of the paper to a format level specified by the code unless modified by an auto page eject condition. The format level selection clears after the paper has advanced to that level but the preprint spacing mode remains selected.

Select Format Level 2 for Preprint Line Spacing (0052)

Select Format Level 3 for Preprint Line Spacing (0053)

Select Format Level 4 for Preprint Line Spacing (0054)

Select Format Level 5 for Preprint Line Spacing (0055)

Select Format Level 6 for Preprint Line Spacing (0056)

Select Format Level 7 for Preprint Line Spacing (0057)

Select Format Level 8 for Preprint Line Spacing (0060)

Select Format Level 9 for Preprint Line Spacing (0061)

Select Format Level 10 for Preprint Line Spacing (0062)

Select Format Level 11 for Preprint Line Spacing (0063)

Select Format Level 12 for Preprint Line Spacing (0064)

STATUS CODE DESCRIPTIONS

The status codes carry controller and printer status information to the data channel. When a condition represented by a status code is present, that status code is put on the status lines to the data channel. Any number of status conditions may exist simultaneously.

Ready (XXX1)

This status response indicates that the controller/printer assembly is ready for operation (power supplies are operating, paper is present, image memory content is in odd parity, and the printer gate is closed).

Busy (XXX2)

This response indicates that the controller/printer assembly is busy (a data transfer or paper motion is in progress). If the error checking facilities should fail, this status appears and will remain after the completion of the present operation.

Compare Fault (XXX4)

This response indicates that after up to two revolutions of the print train, one or more illegal character codes remain in the buffer memory.

Paper Fault (XX1X)

This response indicates that the printer paper supply has been exhausted, that a paper tear has been detected, or that the paper has jammed.

Last Line of Form (XX2X)

This response indicates that the paper is positioned on the last line of the form. This status will drop as soon as the paper moves away from this position. The last line position is represented by a hole in the format tape at level 12.

Format Tape Level 9 (XX4X)

This response indicates that the paper position corresponds with the hole in the format tape which determines the location of format level 9.

Memory Busy (X1XX)

This response indicates that the buffer memory contains data which has not been printed. The status report comes up with first data loaded into the memory and goes down at the completion of a print cycle. (Note that this response does not rise until 2.0 μsec after the Busy signal rises.)

Ready and Not Busy Interrupt (X2XX), End of Operation Interrupt (X4XX) or Abnormal End of Operation Interrupt (1XXX)

The response of X2XX, X4XX, or 1XXX indicates which of the conditions has caused an interrupt signal. One or more of these status signals will be present any time an interrupt signal is present.

Print Error (2XXX)

This response indicates that a condition has been detected which may have caused a print error in the last print operation. This response is cleared at the beginning of the next print operation.

6/8 Line Coincident (4XXX)

This response indicates that selection of a change from 6 to 8 lines per inch spacing or vice versa can be made without introducing a spacing error. See the Programming Considerations section of this manual for information concerning the use of this information.

PROGRAMMING CONSIDERATIONS

MULTIPLE SPACING

If multiple line spacing is desired, program a single command which will provide the full spacing. Avoid the use of single spacing to move the paper more than one space because multiple single spacing tends to overheat the paper advance mechanism. The speed is automatically slowed to compensate for overheating.

PRINTING RATES

With a 48-character type train, the printer prints at a minimum rate of 1200 lines per minute. Short lines may print at a rate of up to 2500 lines per minute for a short while. Prolonged printing at this rate is not possible because of overheating problems, so the speed automatically slows to about 1500 lines per minute.

LOADING THE IMAGE MEMORY

To load the image memory, the Fill Image Memory code (0012) must first be issued (the printer must be ready, as indicated by a lighted START indicator). This sets the controller so that 288 9-bit character codes can be loaded. During the loading

operation, printing is disabled and the printer is not synchronized. If fewer than 288 character codes are loaded, the FILL IMAGE indicator stays on and printing remains disabled.

NOTE

The character codes must be loaded in exactly the same order as the characters on the type train and exactly 288 characters must be loaded.

STARTING THE TRAIN (TYPE ARRAY) ROTATION

The train (type array) will automatically stop rotating if no printing or paper motion is attempted within any continuous 30 second period. Any print (line output) or paper motion operation will start the train rotation again. From the at rest position the train takes a minimum of 460 milliseconds to get synchronized with the electronics. This can occur in parallel with the time required for a paper motion. The train must be synchronized before printing can occur. There will be no synchronization delay required for subsequent lines of print unless a 30 second period of no operation occurs again.

BCD CHARACTER CODES

The CONTROL DATA®512 Line Printer has many possible type trains. The character represented by a given Control Data Internal BCD code is not the same for all trains. Appendix A is a suggested correlation of Internal BCD codes to characters for type trains 595-1 (501 compatible), 595-2 (IBM "AN"), 595-3 (IBM "HN"), 595-4 (CDC ASCII subset), 595-5 (Std. ASCII), and 595-6 (94 character Std. ASCII). The suggested correlations are those used in standard CDC diagnostics and software. However, a programmer can assign any character to BCD code correlation he wishes.

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OPERATION

CONTROLS AND INDICATORS

The controls and indicators for the controller are located on the printer front panel, the printer back panel, and the controller logic chassis inside the printer. The front and back panels also contain controls and indicators which apply only to the printer. Descriptions for all switches and indicators are included below. (The controls and indicators are on the front panel unless otherwise noted.)

POWER ON Switch/Indicator

This switch applies ac power to the printer power supplies, fans, and motors. The switch lights to show only that the switch has been activated. It does not indicate that the printer is fully powered up because it will light even if the printer does not fully power up and it will stay lighted even if some part of the power automatically shuts down.

POWER OFF Switch/Indicator

This is a momentary action switch which disconnects ac power from the printer. This switch does not affect the controller.

START Switch/Ready Indicator (Front and Back panels)

This is a momentary action switch which makes the printer Ready for operation. If the switch/indicator remains lighted, the printer is Ready and if it does not remain lighted, the printer is Not Ready. When a paper fault exists, the switch/indicator can be used to step the paper one line at a time (single cycle operation) to the next top of form. This switch/indicator can be used to clear transmission parity error indications.

STOP Switch/Maintenance Indicator (Front and Back panels)

This is a momentary action switch which makes the printer Not Ready for operation. If pushed during a print operation, it inhibits printing after completion of the print line in progress. If a Ready condition exists when a Paper Fault condition is corrected, the START switch must first be pushed and then the STOP switch must be pushed to make the printer Not Ready. The switch/indicator remains lighted when the maintenance TEST MODE switches on the controller are activated.

SINGLE SPACE Switch (Front and Back panels)

This is a momentary action switch which advances the paper one line.

PAGE EJECT Switch (Front and Back panels)

This is a momentary action switch which advances the paper to the next top of form position.

6 LINE/8 LINE Switch/Indicator

This is a double switch/indicator that manually selects and shows which line density is selected.

CONN/TRANS PAR Indicator

This is a double indicator which shows that the printer is connected with the data channel (left side is lighted) or that a transmission parity error has been detected (right side is lighted).

ERROR OVERRIDE Switch/Indicator

This is a switch which enables a print-out of data with a transmission parity error. It prevents an Abnormal End of Operation interrupt or a Print Error interrupt from being sent to the data channel. This switch should be used only by maintenance personnel because it disables parity checking. The switch/indicator remains lighted when it is activated.

MEM PAR/MEM BUSY Indicator

This is a double indicator which shows that a buffer memory parity error has been detected or that printable data is in the buffer memory (memory busy).

COMP FAULT/PRINT ERROR Indicator

This is a double indicator which shows that a compare fault or a print error has been detected.

FILL IMAGE/CONT PWR Indicator

This is a double indicator which shows that controller image memory loading is enabled or that dc power is applied to the controller.

The following indicators are located on the printer front
panel below the switches and indicators described above.
They do not become visible until they are lighted.

THERMAL Indicator

This indicator lights to indicate that at least one of the printer cabinet temperature
sensors has detected a high temperature. The power is interrupted so that the printer
shuts down when this condition exists.

DC POWER Indicator

This indicator lights to indicate that one of the dc power supplies is not producing the
necessary power. The printer becomes Not Ready when this condition exists.

GATE Indicator

This indicator lights to indicate that the printer gate is not closed. The printer is Not
Ready when this condition exists.

PAPER FAULT Indicator

This indicator lights to indicate that the paper supply is exhausted, or that the paper
is torn or jammed. This indicator also lights to indicate that the printer 6- or 8-line
select knob, located above the paper drive motor, is not engaged.

PAPER MOTION Indicator

This indicator lights to indicate that a paper motion lasting longer than 600 milliseconds
has been detected. The paper advance is stopped. A printer or system Master Clear
must be performed to restart operation.

HAMMER FUSE Indicator

This indicator lights to indicate that a hammer fuse has opened. When the hammer is
commanded to fire and fails to do so, the error detection stystem reports the error.

SYNC Indicator

This indicator lights to indicate that the controller counters are not synchronized with
the print train. When this indicator and the PRINT ERROR indicator are lighted after

a print cycle, the absence of an error bit location reply (End of Record only) to the data channel shows the problem to be a sync problem.

IMAGE PARITY Indicator

This indicator lights when a parity error is detected in an image memory readout. This condition causes the printer to go Not Ready.

Maintenance Switches

These switches, located on the logic chassis, are to be used only by maintenance personnel for troubleshooting and maintenance.

FORMAT CONTROL

Format control is provided by a punched tape which is mounted on sprockets in the printer. The tape provides a specific printing format according to the pattern of punched holes. The tape can contain formats for 6-line per inch and/or 8-line per inch density or it may contain a format of mixed density. Format level 1 is always the Top of Form and format level 12 is always the Last Line of Form.

FORMAT SELECTION

To space paper reliably when the format tape provides both 6- and 8-line per inch formats, a change from one to the other must be made with the printer stopped at a point of coincident status (6/8 Line Coincident). After a switch in spacing, the format control can not be used for the next 1/2 inch of paper. This restriction also applies to changes made at a Top of Form. The density may be selected with a switch on the printer control panel or by program (code 0010 or 0011).

FORMAT TAPE INSTALLATION

Certain precautions must be taken when installing a format tape on the printer. If the format tape is punched only for a single density format (6- or 8-line per inch), the tape can be installed on the printer sprockets without regard to coincident marks.

If the tape is punched for multiple spacing formats (6- and 8-line per inch), the tape must be installed in exactly the right position. The sprocket coincident mark must always be aligned with the same tape mark. This becomes important in replacing a worn tape because the new tape must exactly match the old tape and must be installed in exactly the same position.

NOTE

All spacing is done with two lines of anticipation, so
the printer appears to stop 2-1/2 lines beyond the
punched level when it is spacing correctly.

Punching Format Tapes

A special format tape punch (CONTROL DATA P/N 44870300) is required to punch new format tapes. Holes should be punched in the tape according to the following table.

501 COMPATIBLE FORMAT TAPE

Frame	Levels to be Punched												Frame	Levels to be Punched											
	1	2	3	4	5	6	7	8	9	10	11	12		1	2	3	4	5	6	7	8	9	10	11	12
1-67	X	X	X	X	X	X	X	X	X	X	X		17-83		X		X				X			X	
2-68											X		18-84											X	
3-69		X									X		19-85		X	X			X			X		X	
4-70			X						X		X		20-86											X	
5-71		X		X							X		21-87		X		X	X					X	X	
6-72				X							X		22-88			X				X		X		X	
7-73		X	X			X			X		X		23-89		X									X	
8-74							X				X		24-90											X	
9-75		X		X				X			X		25-91		X	X	X		X		X	X		X	
10-76			X						X		X		26-92					X						X	
11-77		X			X					X	X		27-93		X									X	
12-78											X		28-94			X						X		X	
13-79		X	X	X		X			X		X		29-95		X		X			X				X	
14-80											X		30-96											X	
15-81		X					X				X		31-97		X	X		X	X			X	X	X	
16-82			X		X				X		X		32-98											X	

501 COMPATIBLE FORMAT TAPE (Cont'd)

Frame				Levels to be Punched								Frame				Levels to be Punched							
	1	2	3	4	5	6	7	8	9	10	11	12		1	2	3	4	5	6	7	8	9	10	11	12
33-99		X		X				X			X		50-116							X				X	
34-100			X						X		X		51-117	X				X					X	X	
35-101	X										X		52-118			X						X		X	
36-102					X		X				X		53-119	X			X							X	
37-103		X	X	X		X			X		X		54-120											X	
38-104											X		55-121	X	X				X			X		X	
39-105		X									X		56-122					X						X	
40-106			X						X		X		57-123	X		X				X	X			X	
41-107		X		X	X			X		X	X		58-124			X						X		X	
42-108											X		59-125	X										X	
43-109		X	X			X	X		X		X		60-126											X	
44-110											X		61-127	X	X	X	X	X				X	X	X	
45-111		X		X							X		62-128											X	
46-112			X		X				X		X		63-129	X										X	
47-113		X									X		64-130			X				X		X		X	X
48-114											X		65-131												
49-115		X	X	X		X		X	X		X		66-132												

Cut the tape on the line at frame 132 and glue together. After the tape is glued into a loop, be sure to re-punch the holes in the last two frames.

APPENDIX A

CORRELATION BETWEEN INTERNAL BCD CODES (OCTAL)

AND TYPE ARRAY GRAPHICS

Int. BCD Code	595-1 (501)	595-2 ("AN")	595-3 ("HN")	595-4, 595-5 (ASCII)	Int. BCD Code	595-1 (501)	595-2 ("AN")	595-3 ("HN")	595-4, 595-5 (ASCII)
00	0	0	0	0	40	–	–	–	–
01	1	1	1	1	41	J	J	J	J
02	2	2	2	2	42	K	K	K	K
03	3	3	3	3	43	L	L	L	L
04	4	4	4	4	44	M	M	M	M
05	5	5	5	5	45	N	N	N	N
06	6	6	6	6	46	O	O	O	O
07	7	7	7	7	47	P	P	P	P
10	8	8	8	8	50	Q	Q	Q	Q
11	9	9	9	9	51	R	R	R	R
12	:			:	52	V			)*
13	=	#	=	"	53	$	$	$	$
14	≠≤	@	'	"	54	*	*	*	*
15				<	55	↑			@
16	%			%	56	↓			?
17	[			,	57	>			>
20	+	+	+	+	60	Blank	Blank	Blank	Blank
21	A	A	A	A	61	/	/	/	/
22	B	B	B	B	62	S	S	S	S
23	C	C	C	C	63	T	T	T	T
24	D	D	D	D	64	U	U	U	U
25	E	E	E	E	65	V	V	V	V
26	F	F	F	F	66	W	W	W	W
27	G	G	G	G	67	X	X	X	X
30	H	H	H	H	70	Y	Y	Y	Y
31	I	I	I	I	71	Z	Z	Z	Z
32	<			(*	72	]	&	&	!
33	.	.			73				(
34	}≥		)	)	74	(	%	(	(
35				\	75	⌐			_***
36	¬			∧**	76	≡			#
37	;			;	77	∧			&

*Code shown is for 595-4. The 595-5 uses [and] in place of (and).
**The ∧(circumflex) and the ¬ are logical NOT symbols.
***Underline.

595-1 XYZ.-+=( )/*,≠$:≤%[ ]ᵣ≡∧∨¬↑↓><≥;

595-4 0123456789:=*&%{+ABCDEFGHI<.)?";-JKLMNOPQR!$*#\> /STUVWXYZ},(a_^&Y18

98 CHARACTER ASCII

OCTAL	HEX	CHAR	OCTAL	HEX	CHAR	OCTAL	HEX	CHAR
040	20	Blank	100	40	@			
1	1	!	1	1	A	141	1	a
2	2	"	2	2	B	2	2	b
3	3	#	3	3	C	3	3	c
4	4	$	4	4	D	4	4	d
5	5	%	5	5	E	5	5	e
6	6	&	6	6	F	6	6	f
047	7	'	107	7	G	147	7	g
050	8	(	110	8	H	150	8	h
1	9	)	1	9	I	1	9	i
2	A	*	2	A	J	2	A	j
3	B	+	3	B	K	3	B	k
4	C	,	4	C	L	4	C	l
5	D	-	5	D	M	5	D	m
6	E	.	6	E	N	6	E	n
057	2F	/	117	4F	O	157	6F	o
060	30	0	120	50	P	160	70	p
1	1	1	1	1	Q	1	1	q
2	2	2	2	2	R	2	2	r
3	3	3	3	3	S	3	3	s
4	4	4	4	4	T	4	4	t
5	5	5	5	5	U	5	5	u
6	6	6	6	6	V	6	6	v
67	7	7	127	7	W	167	7	w
070	8	8	130	8	X	170	8	x
1	9	9	1	9	Y	1	9	y
2	A	:	2	A	Z	2	A	z
3	B	;	3	B	[	3	B	{
4	C	<	4	C	\	4	C	:
5	D	=	5	D	]	5	D	}
6	E	>	6	E	^	6	E	~
77	3F	?	137	5F	_ *			

*Underline.

COMMENT SHEET

MANUAL TITLE __CDC 3555 Line Printer Controller__

__Reference Manual__

PUBLICATION NO. __60231300__   REVISION ___D___

FROM: NAME: _____

BUSINESS
ADDRESS: _____

STAPLE   STAPLE

FOLD   FOLD

FOLD   FOLD

CUT ALONG LINE